Lower Joseph Creek Restoration Project

Aquatics Specialist Effects Analysis
Biological Evaluation/Assessment
Management Indicator Species Report

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This report combines the Aquatics Effects Analysis, Biological Evaluation (Aquatics) and Fish Management Indicator Species(MIS) report in one document for the Lower Joseph Creek Restoration Project, Wallowa Valley Ranger District, Wallowa-Whitman National Forest.

Project Description

Need for Action

The purpose of this project is to restore, maintain, and enhance local economies and increase forest resiliency to natural disturbance process, modify fire behavior potential, improve future fire management opportunities, and protect natural resources at risk to elevated occurrence of insects, disease, and wildfires. The need for these treatments is based on significant deviation of vegetation and fuel conditions across the landscape in comparison to historic ranges. Decades of fire suppression and past forest management have resulted in overstocked stand conditions, and hazardous fuels build-up. Dry forest types are showing significant depletions of late old structure, early seral species, and large tree component

Desired Condition

Desired stand conditions include ecologically appropriate species compositions and structures that promote resilient stand conditions resistant to insect and disease infestations and likely continued occurrence of wildfires. It is desired to create a more fire resilient landscape through reduction of ladder fuels, crown densities (overlapping of live tree crowns), and an increased distance of the canopy base height from the surface fuels providing proactive management for protection near and around cultural sites from all disturbances. Reduce fuel loadings at known sites to minimize the impacts of wildfire by creating conditions that promote a low intensity, short burning, duration fire. Promote health and vigor of residual stands and accelerate the development of large trees of early seral species and trees with old-growth physical characteristics consistent with HRV goals. There is need to create a more balanced distribution of stem initiation (SI) stands to meet historic levels and move stands toward multi-storied large tree common (MSLTC) and single storied large tree (SSLT) shifting the landscape to more historical ranges of distribution.

Existing Condition

Alternative 1 (No Action Alternative)

Alternative 1 is the no action alternative and serves as a baseline for evaluating other alternatives during the effects analysis for proposed actions. The Lower Joseph Creek Restoration Project would not be implemented under Alternative 1. No management actions would be taken to influence the direction or rate of change for moving existing conditions toward desired condition. Current activities such as permitted grazing, dispersed recreation use, fire protection, and scheduled road maintenance would continue within the project area. The existing land and resource conditions would be otherwise unaffected, except through natural processes.

Alternative 2

See FEIS

Alternative 3

See FEIS

Comparison of Alternatives

Tables 1, 2, and 3 provide information for comparing and summarizing the alternatives. The numbers in these tables represent the best available estimates using information such as maps, aerial photographs, and Geographic Information System data.

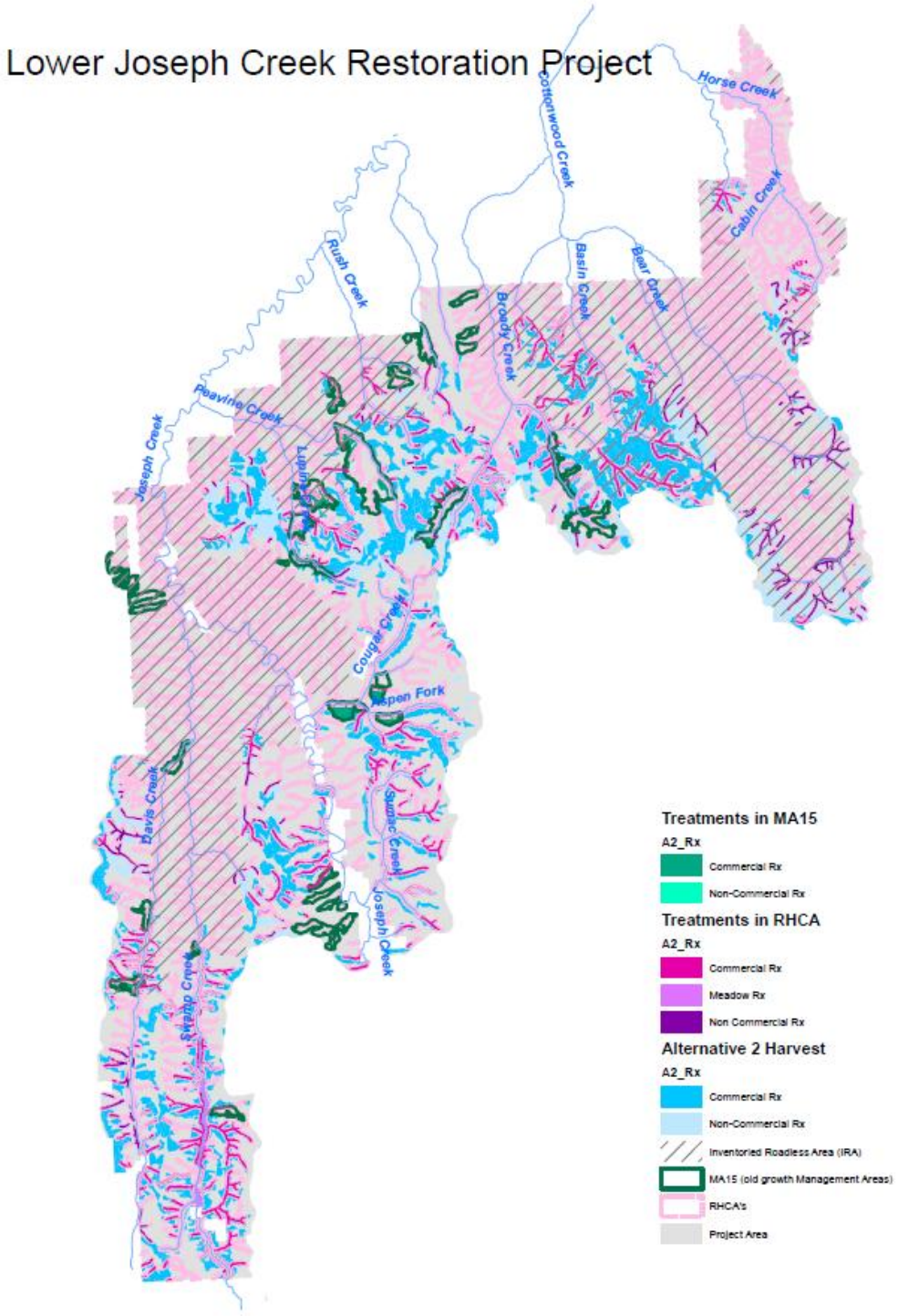
Table 1 - Summary of Activities by Alternative

Activities	Alternative 1	Alternative 2	Alternative 3
Forest Treatment Activities			
Treatment (acres)	0	15,400	10,300
Timber Stand Improvement (acres)	0	5,400	3000
Est. Volume (MCCF)	0	5,100	2,603
RHCA Treatment (acres)	0	2571	749
Fuels Treatment			
High Priority (acres)	0	48,600	46,500
Road Management Activities			
Specified Road Construction (mi)	0	0	0
Road Reconstruction/ Maintenance (mi)	0	82.6	82.6
Temporary Roads Proposed (mi)	0	12.6	12.6
AOP Culvert Replacements	0	6	6

Table 2 – Comparison of Key Issues by Alternative

Key Issues and Indicators	Alternative 1	Alternative 2	Alternative 3
Issue 1 – Transportation Network			
Specified Road Construction (miles)	0	0	0
New Temporary Road (miles)	0	12.6	12.6
Roads in RHCAs (miles) Lower Joseph	59.5	56.9	58.1
Roads in RHCAs (miles) Upper Joseph	39	56.7	62.0
Total Stream Crossings Lower Joseph	192	192	201
Total Stream Crossings Upper Joseph	277	215	277
Total Road Density (miles/mile^2) Lower Joseph	1.78	1.76	1.84
Total Road Density (miles/mile^2) Upper Joseph	2.43	2.10	2.42
Issue 2 – Forest Structure and Composition moving Towards HRV			
CAT 4 RHCAs Treated (Acres)	0	1800	0
CAT 1 RHCAs Treated (Acres)	0	31	0
RHCAs Treated –TSI (Acres)	0	750	750
Issue 3 – Forest Management in Old Growth Preserves and IRAs			
MA15 Treated (Acres)	0	650	0
IRAs Treated (Acres)	0	1,600	0

Figure 1. Forest Treatment units and RHCA delineation and treatment units for Lower Joseph Creek Restoration Project area – Alternative 2.



Project Area

The project area is about 98,918 acres in size and is located within the Upper Joseph Creek (HUC 170601060203) and Lower Joseph Creek (HUC 170601060204) watersheds of the Grande Ronde River Basin. The specific subwatersheds in the project area are listed in Table 3.

Table 3. Location of Lower Joseph Creek restoration project high priority fuels treatment acres by alternative and by watershed and subwatershed.

Watershed	Subwatershed	Treatment	Alt 2 Treatment (Acres)	Alt 3 Treatment (Acres)
Upper Joseph Creek				
	Cougar Creek	Fuels	5690	5690
	Davis Creek	Fuels	4838	4838
	Lower Swamp	Fuels	7834	7834
	Sumac Creek	Fuels	4484	4484
Lower Joseph Creek				
	Broady Creek	Fuels	5645	5645
	Horse Creek	Fuels	2106	2106
	Lower Cottonwood	Fuels	3663	3663
	Upper Cottonwood	Fuels	5579	5579

Peavine Creek			
	Fuels	5600	5600
Rush Creek			
	Fuels	3014	3014
Lower Joseph Creek Project Total			
	Fuels	48638	48638

Aquatic Effects Analysis Area

There are 11 fish bearing streams in the project area (Figure 2). The aquatics effects analysis area includes Joseph Creek and its major tributary streams, Davis Creek, Swamp Creek, Sumac Creek, Little Elk Creek, Peavine Creek, EF Broady Creek, WF Broady Creek, Broady Creek, Cottonwood Creek, Cougar Creek, and upper Joseph Creek. Measurable effects from proposed activities are unlikely to extend downstream to Joseph Creek below the confluence of Rush Creek and downstream to Broady Creek to the confluence of Joseph Creek. Snake River steelhead and redband trout are present in the analysis area.

Riparian Management Objectives

Critical aquatic habitat elements as defined by the Wallowa-Whitman National Forest Land and Resource Management Plan (1990), including the 1995 PACFISH amendment and the 1998 Biological Opinion (BO) for the Forest Plan include: 1) pool frequency, 2) water temperature, 3) large woody debris, 4) bank stability, 5) width to depth ratio, and 6) fine sediment levels. These habitat elements referred to as Riparian Management Objectives (RMOs) are important indicators of aquatic habitat function and health. These RMOs were designed for fish bearing streams in anadromous watersheds.

There are 11 fish bearing (PACFISH Category 1) streams in the analysis area (Figure 2). Eight of the 11 fish-bearing streams have had stream surveys completed (Table 4). Sumac Creek has not had a stream survey completed.

Table 4 shows the results of fish habitat surveys for those streams that have had habitat surveys completed within the LJCRP. This information was obtained from the Region 6 stream survey database and surveys are on file at the La Grande Ranger District, Wallowa-Whitman National Forest. Surveys within the analysis area were completed between 1992 and 2005. Survey

information was collected utilizing the Hankin and Reeves methodology as modified by the PNW R6 Regional Office. Surveys from the early 1990s may not represent current habitat conditions within streams, but does provide information on the general character of streams. The number of pieces of large wood has likely increased since the early 1990s leading to an increase in the number of pools per mile due to additional large wood recruitment. The number of pieces of large wood has likely increased since the early 1990s. Pools per mile could have potentially increased due to the additional large wood recruitment creating additional pools due to scour.

Table 4. Results of aquatic habitat surveys for streams within the LJCRP.

Stream/Year Surveyed	Survey Length (miles)	Pools (#/mile)	%Fine Sediment (<64mm)	Stable Banks (%)	Width /Depth Ratio	Large Woody Debris (LWD) (pcs/mi)
Swamp Creek(2004)	15.44	8	79.5	78	22.1	6
Davis Creek (1995)	6.92	26	ND	95	9.9	67
Joseph Creek(2005)	5.8	3	80	ND	16.8	<1
Broady Creek (1992)	6.55	23	ND	ND	15.7	101
EF Broady Creek(1997)	3.14	34	53.7	99	6.6	113
Cottonwood Creek (1994)	7.15	29	ND	95	16.3	76
Cougar Creek (2005)	2.86	55	80	95	19.6	2
Peavine Creek (1998)	1.74	25	68.8	ND	10.9	7

ND=No Data

Stream survey information is dated for some of the streams. However, recent field examination of some of the streams show that no significant measureable changes have taken place in the LJCRP watersheds that would lead to a change in geomorphic parameters. Fish habitat in the analysis area generally does not meet RMOs for pool habitat and width-to-depth ratio (Table 4) and is considered to be Not Properly Functioning

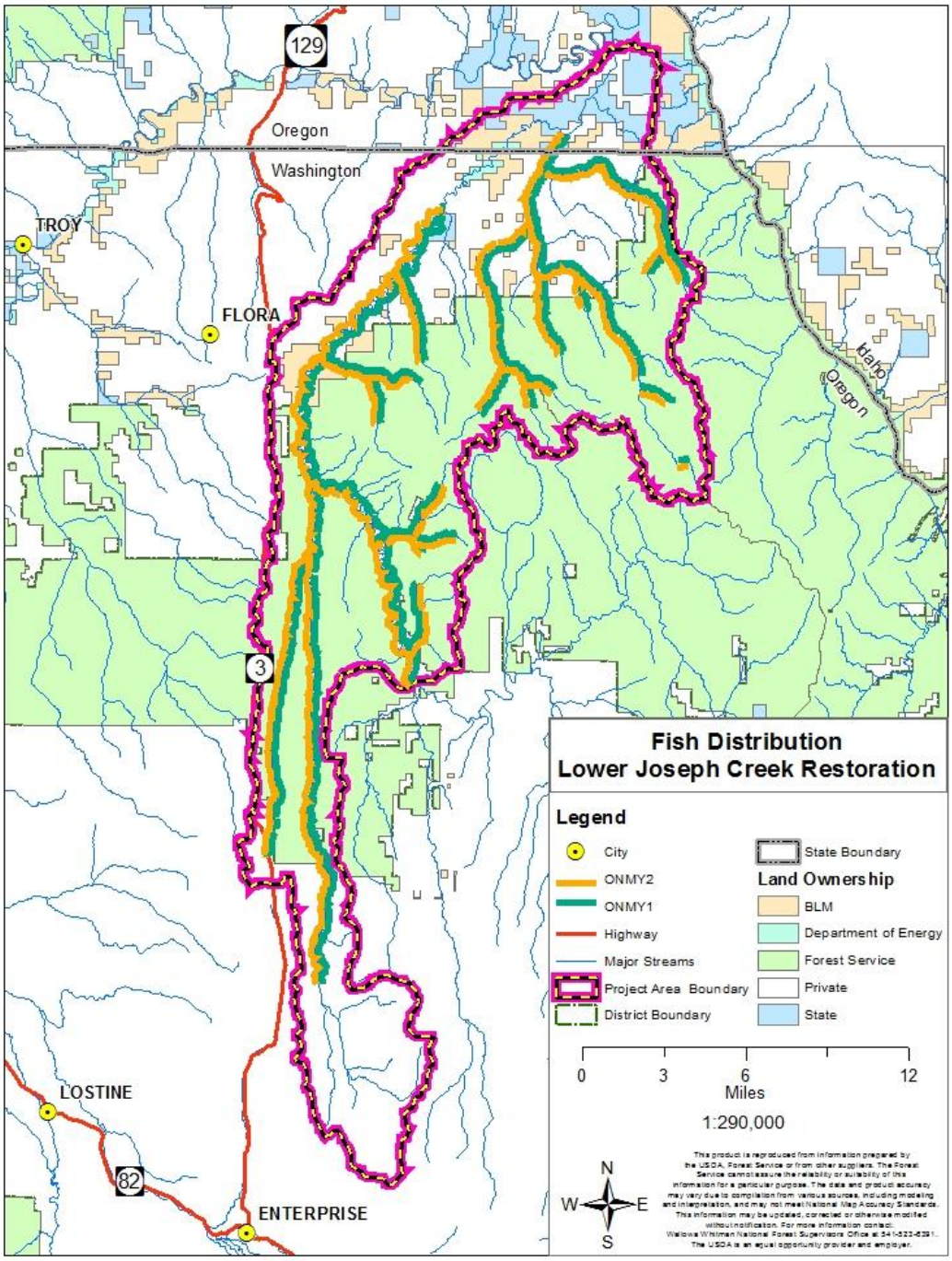
For the LJCP, the two RMOs that may be affected by the implementation any action alternative will be stream temperature and fine sediment. These two RMOs may be affected from forest and fuel treatments primarily in the Category 4 Riparian Habitat Conservation Areas (RHCAs). The potential effect to RMOs will be conveyed downstream to the fish bearing streams where RMOs have been developed and should be applied. The temperature RMO is considered to be Functioning at Risk and the sediment RMO is considered to be Not Properly Functioning.

Fine sediment will be stored in Category 4 streams behind large wood debris that will be delivered from the RHCA. This fine sediment will then be routed downstream, metered out over time, to downstream fish bearing stream where the fine sediment RMOs are assessed

The stream temperature RMO will not be affected by any action alternative that treats Category 4 RHCAs. Since the Category 4 stream is intermittent and not flowing during the time frame where the max 7-day average is measured the actions will not affect the stream temperature RMO.

The remaining RMOs will not be affected by any of the action alternatives due to the implementation of Project Design Criteria. The PDCs will serve to maintain and not retard these RMOs.

Figure 2 Fish distribution, Snake River Steelhead and Redband Trout, within the LJCRP area.



ONMY2 = Snake River Steelhead; ONMY1 = Redband Trout

Table 5. Acres of RHCA category by subwatershed within the Upper Joseph Watershed by subwatershed

Subwatershed Name	Category I RHCAs (acres)		Category 2 RHCAs (acres)		Category 4 RHCAs (acres)		Total RHCAs (acres)	
	Total	**FS**	**Total**	**FS**	**Total**	**FS**	**Total**	**FS**
Broady Creek	875	587	143	143	1,407	1,085	2,425	1,815
Horse Creek	713	411	132	47	2,356	1,115	3,201	1,573
Rush Creek	1,174	108	464	215	2,178	552	3,816	875
Lower Cottonwood Creek	867	169	224	173	1,583	816	2,674	1,158
Upper Cottonwood Creek	806	716	130	130	2,179	1,996	3,115	2,842
Peavine Creek	997	643	166	166	1,698	1,276	2,816	2,085
Total:	**5,432**	**2,634**	**1,259**	**874**	**11,401**	**6,840**	**18,092**	**10,348**

Table 6. Acres of RHCA category by subwatershed within the Lower Joseph Watershed by subwatershed

Subwatershed Name	Category I RHCAs (acres)		Category 2 RHCAs (acres)		Category 4 RHCAs (acres)		Total RHCAs (acres)	
	Total	**FS**	**Total**	**FS**	**Total**	**FS**	**Total**	**FS**
Cougar Creek	869	713	155	155	1,596	1,578	2,620	2,446
Sumac Creek	826	293	152	134	1,032	945	2,010	1,372
Lower Swamp Creek	1,550	1,144	137	113	2,667	1,822	4,354	3,079
Davis Creek	883	715	0	0	1,205	907	2,088	1,622
Total:	**4,128**	**2,865**	**444**	**402**	**6,500**	**5,252**	**11,072**	**8,519**

Aquatic Habitat

Direct and Indirect Effects to Forest Plan RMOs

Fine Sediment RMO

Ecological Importance of RMO

Composition of the stream substrate is an important feature of aquatic habitat. Cobble and gravel substrates provide habitat for a diverse assemblage of benthic macroinvertebrates as well as eggs and early life stages of numerous fish species. Macroinvertebrates represent a substantial portion of the diet available to various fish species, particularly stream dwelling salmonids.

Fine sediment in streams is a normal component of salmonid habitat; however, major disruptions of aquatic ecosystems occur when sediment levels substantially exceed natural levels. Filling of interstitial spaces (i.e. the gaps between rocks on the stream bottom) with fine sediment (particles < 2 mm in size) eliminates habitat for many macroinvertebrates. Fish eggs and early life stages can also be buried and smothered when interstitial spaces are embedded with fine sediment. Studies have shown that an increase in 1-3mm size sand from 20% to 30% can decrease emergent survival of salmonid species from 65% down to 40% (Phillips et al. 1975). Fine sediments are known to impact fry emergence and survival, and fine sediment (<6.5mm in size) levels above 40% can effectively eliminate salmonid populations and many macroinvertebrate species (Everest and Harr 1982). Winter habitat for juvenile salmonids is also lost as interstitial spaces in cobble-sized and larger streambed material are embedded with fine sediment.

Increases in fine sediment can occur from both increased transport of fine sediment from upland areas and from destabilized stream banks. Increases can result from both episodic sources such as wildfires or from chronic sources such a native surface roads. Episodic sources normally result in short-term increases that return to pre-disturbance levels through natural recovery processes. Chronic sources can result in long-term changes of stream channels and aquatic habitat.

Standards and Guidelines

Forest Plan Standards & Guidelines

The Forest Plan (1990) standard and guideline for fine sediment is "Where natural stream characteristics permit...limiting fine inorganic sediment covering stream substrate to 15 percent…" (Wildlife S&G 1). Fine inorganic sediment is defined as sand and silty material less than 3.3 mm in size. The PACFISH amendment (1995) did not include an RMO for fine sediment. The Forest Plan standard was modified in 1995 and subsequently in 1998 as part of the Endangered Species Act (ESA) consultations on the Forest Plan to <20% fine sediment (particles <6.4mm in size) in spawning areas or < 30% embeddedness (NMFS 1995, 1998).

Existing Conditions

Fine sediment levels currently exceed the 20% threshold established under ESA consultation for the Forest Plan (NMFS 1995, 1998) in Swamp, Joseph, E.F. Broady, Cougar and Peavine creeks (Table 4). There is no data for Davis, Elk, Little Elk, Broady, and Cottonwood creeks.

Effects of Alternative 1

Fine sediment levels are generally above the 20% threshold in the analysis area (Table 4).

Current management activities in the analysis area that are likely to be contributing to elevated fine sediment levels are livestock grazing and roads. Past wildfire has likely contributed to an elevated level of fine sediment in some streams in the project area.

The majority of the forested stands in the project area would be represented by a fuel model that is likely to exhibit moderate fire severities in the case of a wildfire. The likelihood of a fire start in the project area is high. Wildfires typically result in increases in fine sediment for three to five years, depending on the wildfire severity (Neary et al. 2005). Adverse impacts to aquatic habitat would likely occur where fine sediment levels exceed the 20% threshold. These levels would likely decrease spawning success for Snake River steelhead and redband trout, and a decrease survival of juvenile salmonids may occur.

Effects of Alternative 2

Commercial Thinning Activities

RHCA widths, as prescribed in PACFISH, will be utilized to protect aquatic and riparian habitats in the LJCRP area (see Design Criteria section). These RHCA delineations would occur on Category 1, 2, and 3 streams, ponds and wetlands.

Category 4 RHCAs will be delineated as prescribed by PACFISH, but will have a silvicultural treatment within the RHCA that will be used to maintain and restore RMOs for the Category 4 stream and RHCA. Only those Category 4 RHCAs that are not in old forest structural stages will be treated (1822 acres). Those RHCAs that are in old forest structure are assumed to be at the RMO for sediment and large wood debris recruitment.

The silvicultural prescription will be similar to the upslope treatment prescription with the addition of a minimum 25 foot variable width no treatment buffer on either side of the Category 4 stream channel. Landings will be located outside of RHCAs. Commercial thinning units will be logged using a combination of ground-based and aerial logging systems.

Under the Alternative 2, commercial thinning activities using mechanical equipment will occur over about 15,400 acres. Ground disturbing activities (i.e. yarding, development and use of skid trails and landings) will be limited to areas outside of RHCAs.

Timber Stand Improvement Activities

Alternative 2 and Alternative 3 will treat 749 acres of timber stand improvement treatments within RHCAs. These acres will be treated to move these acres towards HRV for the planning area. Treatment prescriptions will follow the activity restrictions as described below for all category streams.

PACFISH / INFISH Category	Fish Bearing and Designated Critical Habitat Streams	Permanently Flowing non- fish Bearing and Ponds, Lakes and wetlands > 1 acres	Seasonally Flowing or Intermittent Streams, wetlands < 1 acres, landslides and landslide-prone areas	RHCA Restrictions* (Activities allowed outside the no activity stream buffer**)
Activity	**Default No Activity Buffers**			
Thinning in RHCAs	100’	75’ on slopes < 30%	50’ on slopes < 30%	• treatment by hand only (no ground based equipment) • prior to treatment 500 – 2,500 stems per acre; post treatment fully stocked (generally 175 – 220 trees per acre) • variable spacing • all shade providing trees and long term wood recruitment trees retained • **only trees < 9” dbh**

Fine sediment levels in streams have been shown to increase as the density of roads in a watershed increase (Cederholm and Reid 1987). To access units, no new road construction will be needed for the LJCRP. Road reconstruction will need to take place on 82.6 miles of road in the LJCRP area (Table 1). The WEPP-Road Model estimates that soil eroded off the road segments used for haul routes would be unlikely to reach the nearest stream channels (see Hydrologist Report).

The road density for the Lower Joseph Cree watershed in the LJCRP area are under the consultation requirements for Snake River Steelhead; 2 miles per square mile of total roads to maintain a subwatershed in a functioning appropriately category (Table 7). The Upper Joseph Creek watershed is slightly over the 2.0 miles per square mile total road density (Table 8). There are a number of subwatersheds that contain Snake River steelhead that have elevated road densities (over 2 miles per square mile). The higher road densities, which are an indication of fine sediment delivery to fish bearing streams, would have a potential effect on steelhead and redband trout production. These higher densities are found in three subwatersheds in the LJCRP area.

Table 7. Total Road Density by subwatershed within the Upper Joseph Watershed by Alternative

Subwatershed Name	Alternative 1		Alternative 2		Alternative 3	
	Total Roads	Total Rd Density	Total Roads	Total Rd Density	Total Roads	Total Rd Density
Broady Creek	45.8	2.85	45.8	2.85	49.8	3.11
Horse Creek	18.2	2.01	18.2	2.01	18.2	2.01
Rush Creek	22.4	2.53	20.6	2.33	22.7	2.57
Lower Cottonwood Creek	7.2	0.68	7.2	0.68	7.2	0.68
Upper Cottonwood Creek	25.8	1.35	25.8	1.35	25.8	
Peavine Creek	25.5	1.45	25.5	1.45	25.4	1.45
Watershed Total:	**144.9**	**1.78**	**143.1**	**1.76**	**149.1**	**1.84**

Table 8. Total Road Density by subwatershed within the Lower Joseph Watershed Alternative

Subwatershed Name	Alternative 1		Alternative 2		Alternative 3	
	Total Roads	Total Rd Density	Total Roads	Total Rd Density	Total Roads	Total Rd Density
Cougar Creek	53.0	2.61	38.9	1.92	53.0	2.61
Sumac Creek	46.6	3.11	40.3	2.69	46.6	3.11
Lower Swamp Creek	41.8	1.80	41.8	1.80	41.4	1.78
Davis Creek	30.8	2.48	27.9	2.25	30.8	2.48
Watershed Total:	**172.2**	**2.43**	**148.9**	**2.10**	**171.8**	**2.42**

Temporary roads will be constructed to access commercial thinning units. An estimated 12.6 miles of temporary roads will be constructed (Table 9). The temporary roads would not be constructed in RHCAs. The temporary roads will be obliterated and returned to the natural landscape following completion of haul activities. WEPP estimates that eroded material will not exit the buffers between the closest adjacent stream channels and the temporary roads (see Hydrologist Report).

Table 9. Miles and acres of road reconstuction and temporary roads by alternative.

Alternative	Road Re-Construction/Maintenance		Temporary Road Construction	
	Miles	Acres Disturbed	Miles	Acres Disturbed
2	86.2	186.1	12.6	27.7
3	86.2	186.1	12.6	27.7

The combination of road re-construction/maintenance, temporary road construction (and obliteration), opening and use of closed roads, and log haul traffic will likely result in an increase in erosion rates in the analysis area. Increases in erosion rates will occur in the short-term and then trend towards background levels. RHCAs will likely moderate much of the increase and the amount of sediment reaching stream channels and will likely result in an immeasurable increase in fine sediment levels. (see Hydrologist Report)

PACFISH standards and guidelines for timber harvest activities and RHCAs were developed to limit impacts to aquatic habitat from timber harvest activities. There is a low likelihood that increases in fine sediment resulting from the proposed timber harvest activities will result in measureable increases in fine sediment in fish bearing streams in the analysis area.

Prescribed Fire/Fuels Activities

A total of 98,600 acres are being proposed for treatment. A total of 48,600 acres of fire/ fuels treatment is proposed in high priority areas (Table 3). High priority areas are defined as forest treatment units (activity fuels) and dry forest stands not being mechanically treated by this project. The remaining acres are within grasslands and cold and moist untreated forest stands and are lower priority for prescribed fire treatment

Fire/Fuel treatment (prescribed fire) on the dry forest acres would occur when weather and fuel conditions are appropriate to meet the objectives and prescription. Prescribed burning would be accomplished within a 10 year period depending on environmental conditions needed to meet burning prescriptions. There will be no direct ignition within RHCAs, but fire would be allowed to back into RHCAs

Outside of RHCAs – Alternative 2 and 3

Fuels treatment outside of RHCAs includes mechanical treatment using a slash buster (mastication) and piling slash with a grapple pile machine, and use of prescribed fire in dry forest stands. RHCA widths will be implemented as minimum no activity stream buffers.

Within RHCAs - Alternative 2

The project proposes 1822 acres of forest treatment within RHCAs and 749 acres of stand improvement treatments within RHCAs. Only 31 acres(0.50 mi of DCH) of forest treatment with subsequent fuel treatment is being proposed in DCH Units would receive ladder and ground fuels reduction treatment involving stand improvement thinning of live trees less than nine inches dbh using chainsaws. Ladder fuels branches on trees up to six feet above ground would be pruned. Slash will be piled by hand and burned.

Fire/Fuel treatment units will follow the Blue Mountain Project Design Criteria (PDC) for specific RHCA treatments as described in Table 10. Burning activities would occur in RHCAs in accordance with Blue Mountains PDCs. The use of backing fires in RHCAs would reduce fire intensities while reducing fuel loading. Reduced fire intensities in RHCAs would 1) reduce the potential for mortality of trees that provide shade, 2) reduce the amount of downed woody

material consumed, and 3) reduce the amount of burned area in the RHCAs thus reducing the amount of ground cover loss. Typically, only about 40 to 60% of the area in an RHCA is actually burned due to the use of backing fires and higher fuel moistures

Fire/Fuel treatment (prescribed burning) on the dry forest acres would occur when weather and fuel conditions are appropriate to meet the objectives and prescription. There will be no direct ignition within RHCAs, but fire would be allowed to back into RHCAs

Prescribed fire ignition would not occur in RHCAs to further limit burn intensity and resulting effects to vegetation in RHCAS. Prescribed fire would be allowed to back into RHCAs from adjacent upslope areas. Majority of the burned areas in RHCAs would be concentrated along the outer edges of the RHCAs where fuel moisture levels would be lower compared to areas closer to stream channels. Prescribed burning would result in a greater area of ground cover consumption in RHCAs adjacent to intermittent streams due to lower fuel moistures levels compared to perennial streams.

The burn prescription would target consumption of woody material 3 inches and smaller with nearly all material in this size class consumed. Therefore, fire severity would not be high enough to consume significant quantities of downed wood that play a role in trapping fine sediment on hill slopes, in intermittent stream channels, and on floodplains. Some ground cover would be consumed but would be quickly replaced as litter fall occurs in the first year following burning and herbaceous plants recover in the second year following burning. A measurable increase in fine sediment in stream channels as a result of burning activities is unlikely due to the combination of a predicted patchy, low severity burn in RHCAs and typical recovery of ground cover within two years of prescribed burning.

Table 10. Fire/Fuels Activity restrictions for the LJCRP following the Blue Mountains Project Design Criteria

PACFISH / INFISH Category	Fish Bearing and Designated Critical Habitat Streams	Permanently Flowing non- fish Bearing and Ponds, Lakes and wetlands > 1 acres	Seasonally Flowing or Intermittent Streams, wetlands < 1 acres, landslides and landslide-prone areas	RHCA Restrictions
Activity	**Default Limited Activity Buffers***			
Prescribed Fire in RHCAs	100’	75’ on slopes < 30%	50’ on slopes < 30%	• treatment by hand only • all shade providing, instream and long term wood recruitment trees retained • fully stocked canopy retained • hand applied ignition (such as drip torch or fusees) within the limited activity buffer,
Slash Pile Burning	100’	75’	50’	• piles located outside the no activity RHCA buffer width and in locations to avoid damage to remaining overstory canopy • hand piling only (no mechanical treatments) • maximum size four feet in height and six feet in diameter • piles burned when there is a high soil moisture content
* RHCA restrictions are for the areas between the limited activity buffer and boundary of the full PACFISH buffer.				

Effects of Alternative 3

Although difficult to quantify, effects to the fine sediment aquatic habitat element under Alternative 3 would be less compared to Alternative 2 because of a reduction in commercial thinning acres, burning activities, and road reconstruction, and reduction in temporary road construction. In addition there would be no commercial harvest in Category 4 RHCAs. Thus the overall short-term increase in erosion rates in the analysis area is likely to be smaller compared to Alternative 2 (see Hydrologist Report).

Water Temperature RMO

Ecological Importance of RMO

Water temperature influences the metabolism, behavior, and health of fish and other aquatic organisms. Fish can survive at temperatures near extremes of suitable temperature ranges. However, growth is reduced at low temperatures because all metabolic processes are slowed. At the opposite extreme, growth is reduced at high temperatures because most or all energy from food must be used for maintenance needs. Fish are also more susceptible to diseases near the extremes of their suitable temperature ranges. In general, redband trout and steelhead will occupy waterbodies with water temperatures from 55 to 64°F. Upper lethal temperature for steelhead is about 75°F.

Standards and Guidelines

Forest Plan Standards & Guidelines

The Forest Plan water temperature standards are to meet state water quality standards and prevent measurable increases in water temperature (1990 Forest Plan, 1995 PACFISH Amendment), and maintain maximum water temperatures below 64°F within migration and rearing habitat and below 60°F within spawning habitats (PACFISH). The Forest Plan Watershed Standards and Guidelines are:

> **2. Water Quality Standards and BMP's.** Meet Water Quality Standards for waters of the States of Oregon (Oregon Administrative Rules, Chapter 340-41) and Idaho through planning, application, and monitoring of Best Management Practices (BMP's) in conformance with the Clean Water Act, regulations, and federal guidance issued thereto.
>
> **7. Stream Temperatures.** Prevent measurable temperature increases in Class I Streams (less than a 0.5 degree Fahrenheit change). Temperature increases on SMU Class II (and fishbearing Stream Management Unit Class III) streams will be limited to the criteria in State standards. Temperatures on other streams may be increased only to the extent that water quality goals on downstream, fish-bearing streams will still be met. Normally, stream shade management on Class III streams will differ little from treatment on Class II streams

Oregon State Water Temperature Standards

In addition to meeting the Forest Plan standard, the Forest must meet Oregon water quality standards under the Clean Water Act. EPA approved new water quality standards for Oregon in March 2004. Streams in the aquatic effects are considered "salmon and trout rearing and migration habitat" for Oregon water temperature standards. For the aquatic effects area, the following water temperature standard applies:

> The seven-day-average maximum temperature of a stream identified as having salmon and trout rearing and migration use on subbasin maps set out at OAR 340-041-0101 to 340-041-0340: Figures 130A, 151A, 160A, 170A, 220A, 230A, 271A, 286A, 300A, 310A, 320A, and 340A, may not exceed 18.0 degrees Celsius (64.4 degrees Fahrenheit);

Existing Conditions

Limited water temperature monitoring has occurred in the analysis area (Table 11). The 7-day average temperature in Upper Davis and Lower Davis Creek remained below the 18° C/64.4° F standard for the period of record with the exception of 2012. The two sites on upper Swamp Creek remain at or slightly elevated above the standard and the site at lower Swamp Creek is consistently elevated above the standard for the period of record. Joseph Creek has record elevated temperatures of at least 15 degrees above the standard. Cougar and Broady Creek are consistently below the standard.

Table 11. Results of stream temperature monitoring within the LJCRP area.

Location	Maximum Weekly Average Temperature (F^o)								
	2004	2005	2006	2007	2008	2009	2010	2011	2012
Upper Davis Creek							63.9	63.3	
Lower Davis Creek							59.7	57.6	68.5
Swamp Creek @ FS Bndry		64.2	66.0	65.8	63.3				66.6
Swamp Creek @ Bennett Pasture	67.8	67.8		68.5	65.3				
Swamp Creek @Ford (WG5)	73.9	73.2	77.2	74.7	70.9	72.9		70.9	
Joseph Creek						81.0		79.0	82.2
Cougar Creek						62.1	61.9		
Broady Creek below WF								58.6	59.5
Elk Creek @ Bridge (below Gould Gulch)	66.6	63.9	66.7	66.0	63.3	65.1	64.8	64.2	66.9

Effects of Alternative 1

The majority of the timbered stands would be represented by a fuel model that is likely to exhibit moderate to high fire intensities and severities. These conditions increase the likelihood of a large-scale wildfire in the project area (see Fuels Specialist Report). A wildfire in the area could elevate water temperatures for up to 10 years, depending on the wildfire severity (Dunham et al. 2007). If water temperatures exceeded 64^{o}F for an extended period of time as a result of wildfire, survival of salmonids would likely be reduced.

Effects of Alternative 2

Thinning Activities

Thinning activities will occur in only in Category 4 RHCAs under this alternative. There will be a minimum 25 foot variable width no treatment buffer on all Category 4 RHCAs proposed for treatment. No effect to stream temperature from the Category 4 RHCA treatments will be realized.

Only 31 acres of Swamp Creek, a Category 1 stream, (located in upper Swamp Creek) are proposed for treatment. These acres will be treated to remove some existing shade producing trees (all trees over 15 in dbh will be left) but in the long term serve to restore the meadow storage capacity. This increase in storage capacity and the restoration of riparian shrubs, will reduce water exposure to direct solar radiation and serve to contribute to a reduction in stream temperatures in the long term.

For all other Category 1 and 2 streams, restricting activities to areas outside of RHCAs will prevent impacts to existing stream shading along perennial streams in the aquatic effects analysis area. The RHCA width adjacent to these streams, 300 feet for Category 1 streams and 200 feet for Category 2 streams, are sufficient to prevent removal of trees that provide stream shading. Therefore, measurable increases in stream temperatures will not result from proposed thinning activities.

Prescribed Fire Activities

Proposed burning activities will result in a low severity fire in RHCAs adjacent to perennial streams in the project area. This will be accomplished by burning when fuel moisture levels are high, not actively lighting fires in RHCAs, and allowing fires to back into RHCAs from adjacent upslope areas. These techniques result in low intensity fires that burn in a patchy distribution of burned and unburned areas in RHCAs. Trees killed by prescribed fire in RHCAs will primarily be understory trees ($\leq$ 8" dbh). Understory trees of this size typically do not provide significant levels of stream shading.

Few riparian shrubs are also expected to be killed as a result of the proposed burning because they are present in the moister riparian areas. Where the above ground portions of riparian shrubs are killed, they will likely sprout back relatively quickly because the low severity fire will not be hot enough to kill the roots.

The proposed burning in RHCAs adjacent to intermittent streams poses little risk of increasing stream temperatures because these streams are normally dry during the summer and fall months. Based on these factors, the LJCRP is unlikely to result in a measurable increase in water temperature and a degradation of water quality in streams in the aquatic effects analysis area.

Effects of Alternative 3

For Alternative 3, commercial thinning activities will not occur in RHCAs adjacent to Category 1 (fish bearing) and Category 2 (nonfish-bearing perennial) streams or Category 4 (intermittent). Restricting these activities to areas outside of RHCAs of Category 1 and 2 streams will prevent adverse impacts to existing stream shading along streams in the analysis area. The RHCA widths adjacent to Category 1 streams (300 ft on either side) and Category 2 streams (200 ft on either side) are sufficient to prevent removal of trees that provide stream shading. Therefore, measurable increases in stream temperatures will not result from proposed thinning activities.

Burning activities under Alternative 3 would be reduced compared to Alternative 2 based on acres treated. With a reduction in activity fuels treatments the possibility of burning up large shade producing trees will be reduced thereby reducing the effects of the alternative on water temperature.

Additional Forest Plan RMOs

Effects of Alternatives 2 and 3

Timber Harvest Activities

Impacts to the other RMOs (i.e. pool frequency, LWD, bank stability, lower bank angle, and width-to-depth ratio) are unlikely. Thinning units, skid trails, and landings will not be located in RHCAs under the action alternatives. Restricting these activities to areas outside of RHCAs will prevent adverse impacts to existing pool habitat and future pool habitat. RHCA widths for Category 1 streams are sufficient to prevent removal of trees that have the potential to fall into stream channels as LWD and create pool habitat.

Impacts to channel morphology RMOs (i.e. bank stability, lower bank angle, and width-to-depth ratio) will not occur because activities that could result in mechanical bank disturbance will not occur in RHCAs under the action alternatives. Some areas of decreased bank stability may occur where herbaceous vegetation along streambanks is top-killed during burning activities.

Prescribed Burning Activities

Impacts to the other RMOs (i.e. pool frequency, LWD, bank stability, lower bank angle, and width-to-depth ratio) are unlikely. Proposed burning activities will not likely impact existing LWD or future LWD because the burn prescription will target consumption of material 3 inches and smaller. Fire intensities will not be high enough to consume trees or downed wood large enough to function as LWD (> 20" dbh) in stream channels. Therefore, burning activities will not result in a reduction of current or future levels of LWD or pool habitat under the action alternatives.

Effects to WSR

There will be no impact from any action alternative to the Joseph Creek Wild and Scenic River corridor or the ORVs associated with the JC WSR.

Effects to PWAs

There will be no effect to fisheries resources from any action alternative to the PWAs

Effects to RNAs

There will be no effect to fisheries resources from any action alternative to the designation of the two RNAs

Cumulative Effects

The cumulative effects analysis area for aquatic resources is the same as the aquatics effects analysis area used for the direct and indirect effects analysis.

Water Quality, Fisheries Habitat, and Populations

Project	Potential Effects	Overlap in:		Measurable Cumulative Effect?	Extent Detectable?
		Time	Space		
Activities On National Forest					
Fuelwood Cutting	Sediment delivery	Yes	Yes	No	Fire wood cutting is prohibited within RHCAs. Fire wood cutting takes place in uplands outside of RHCAs due to restrictions and access. Detectable cumulative effects would not occur.
Designated OHV Trails and Areas - Future	Beneficial effects, reduced sediment delivery to stream channels and reduced impacts to riparian areas.	Yes	Yes	No	Not detectable at the subwatershed scale. There are approximately 50 miles of designated trails in the LJCRP area. The Wallowa-Whitman Travel Management Plan is planned for completion following Forest Plan Revision. OHV use will be regulated and will prevent or minimize direct and indirect effects to water quality and fisheries resources resulting in beneficial effects.
Trailheads and Campgrounds-	Sediment delivery, impacts to streambanks and riparian areas.	Yes	Yes	No	The Coyote and Dougherty Campgrounds are located in uplands outside of RHCAs. The Chico and Frog Pond trailheads are located outside of RHCAs. Continued use of these sites will not result in a measurable increase in sediment yield, or increase in stream temperature since the overstory and riparian vegetation are relatively intact. .
Travel Management Plan	Beneficial effects reduced sediment delivery to stream channels and	Yes	Yes	No	The Wallowa-Whitman Travel Management Plan is planned for completion following the Forest Plan Revision. Vehicle use will be regulated and will prevent or minimize direct and indirect

Project	Potential Effects	Overlap in:		Measurable Cumulative Effect?	Extent Detectable?
		Time	Space		
	reduced impacts to riparian areas.				effects to water quality and fisheries resources resulting in beneficial effects.
Road Maintenance	Sediment delivery	Yes	Yes	No.	Not measureable at the subwatershed scale. Road maintenance can reduce erosion of the road surface and decrease sediment yield to streams.
Range Allotments	Removal of riparian vegetation, streambank damage, and sediment delivery	Yes	Yes	No	Improved management (primarily fencing and grazing strategies) for domestic livestock grazing have reduced impacts to riparian areas and stream channels due to the implementation of PACFISH standards and guidelines. The LJCR project is designed to prevent measureable increases in sediment yield to streams, No riparian vegetation would be removed, and no streambank disturbance would occur and would not contribute to cumulative effects from grazing.
Private Land Activities					
Logging and Fuels Reduction	Modification of ECA, sediment delivery	Yes	No	No	After implementation of the LJCR Project the ECA will not change and will not add to cumulative effects to private land. Ground disturbing activities in the LJCR project are away from streams and will not contribute to cumulative effects to private land in regard to sediment.
Grazing	Sediment delivery, removal of riparian vegetation	Yes	No	No	The LJCR project is not removing riparian vegetation. Ground disturbing activities in the LJCR project are away from streams and will not contribute to cumulative effects to private land in regard to sediment or streambank damage.
Roads	Sediment delivery	Yes	No	No	No new road construction is proposed in the LJCR project. With the exception of road decommissioning (limited ground disturbance) in the LJCR project are away from streams and will not contribute to cumulative effects to private land in regard to an increase in sediment yield.

Past & Ongoing Activities

Vegetation Management Activities

Past vegetation management activities in the LJCRP include a number of commercial and precommercial as well as prescribed fire activities. All of these activities are for the most part over 10 years old. Potential impacts from these vegetation management activities have likely abated. Impacts from road construction and reconstruction are discussed separately.

Grazing Allotments

The analysis area for aquatic resources for the LJCP includes portions 15 livestock grazing allotments. Nine are managed under the Wallowa Whitman LRMP (1990) with amendments including Al-Cunningham, Buck Creek, Cougar Creek, Crow Creek, Davis Creek, Fine, Hunting Camp/Table Mountain and Swamp Creek. Five are managed under the HCNRA Comprehensive Management Plan (200?), Cache Creek, Cold Springs, and Jim Creek. Three of the allotments have portions of pastures in both the Wallowa Valley Ranger District and the HCNRA; Chesnimnus, Doe Creek and Teepee Elk.

Effects on Aquatic Habitat Conditions

Bank alteration, browsing of shrubs and high fine sediment levels along creeks within the active allotments are being addressed by improved management and administration of the grazing that occurs in riparian areas. Condition of aquatic and riparian habitats should improve as a result of these improvements in management. Increased monitoring will be occurring to document whether the expected changes occur.

Noxious Weed Treatments

Noxious weed treatment is an ongoing project that occurs within all project area subwatersheds. These treatments were determined to either have No Effect or to May Affect, Likely to Adversely Affect Snake River steelhead. Consultation with NOAA Fisheries has been completed for the May Affect, Likely to Adversely Affect determinations.
Mitigation measures that include type of chemical treatments, application rates, area treated, timing, and buffers on streams significantly reduce the risk of effects from this activity. However, the overall risk of adverse aggregate effects due to noxious weed treatment is rated moderate because they are not completely controllable, and need to be administered.

Recreation Activities

Dispersed Camping - A limited amount of dispersed camping occurs in this area, but due to the relatively steep topography and limited camping along perennial streams, this activity is rated as having a low risk of cumulative effects on aquatic resources, listed fish or their habitat.

Developed Campgrounds – There are two developed campgrounds in the LJCP area: Coyote and Dougherty. Both have limited use during hunting season and season camping during the

summer. This activity is rated as having a low risk of cumulative effects on aquatic resources, listed fish or their habitat.

Transportation System Activities

Maintenance of Roads – Regularly scheduled road maintenance occurs every one to seven years depending on the condition of the road, the assigned maintenance level, and the maintenance priority. Other scheduled maintenance activities occur as specific needs are identified. Maintenance levels for roads are determined by the road management objectives, the intended use, operational requirements, and budget levels. Maintenance activities occur primarily from late April to late November depending on the actual condition of the road and moisture level. Maintenance levels are summarized in the following paragraphs.

Four types of road surface occur in the LJCRP area: (1) native (dirt surface), (2) improved (pit-run surface, spot-rocked), (3) aggregate (crushed rock surface), and (4) asphalt concrete pavement. The surface types vary for each maintenance level of road depending on the long-term objectives for the road.

Road maintenance practices can vary to provide additional protection to soil and water resources. Seeding of closed roads and low-use roads may be intensified. Keeping maintenance equipment away from streams and wet areas and limiting the number of stream crossings may be emphasized to protect soil and water resources. The use of pit-run (3- to 6-in.) rock on roadbeds may be used to increase protection from erosion. Emergency repair of roads may occur after natural disasters such as flash floods or unusually high spring runoff for all maintenance levels.

The short-term effects from all of the transportation activities will be minimized through protection measures, such as instream work windows, operating under dry conditions, etc.). In the long-term, this project will protect and improve existing habitat. The overall risk of adverse aggregate effects for transportation activities in the short term is rated moderate. The overall risk of adverse aggregate effects for transportation activities in the long term is rated positive**.**

Harvest of Special Forest Products-Fuelwood

Collection of fuelwood, Christmas trees, saw logs and house logs (up to three truck loads per permit), and posts and poles are permitted only in Management Areas 1, 3, 6, 10, and 11. Harvest of these products is not permitted in administratively prohibited areas such as developed campgrounds or within 100 feet of wet areas, seeps springs, bogs, and standing or flowing water. No trees are permitted to be cut within 300 feet of perennial fish-bearing streams. Compliance with these regulations is monitored by USFS Special Forest Product Coordinators and Law Enforcement Officers. These activities are given a **low** risk rating for cumulative adverse effects to listed fish species.

Activities on Private Lands

Timber production and livestock grazing are the primary land use activities occurring on private lands adjacent to the project area. Logging operations on private timber lands are required to follow Oregon's Forest Practices Act and are monitored for compliance by Oregon Department

of Forestry. Private lands adjacent to the south and west boundaries of the project area have recently been logged. It is assumed that logging was conducted in accordance with the Oregon Forest Practices Act and therefore impacts to aquatic habitat were successfully mitigated.

Activities, such as roads and timber harvest, on private lands that are likely to result in cumulative effects with activities proposed under LJCRP are assumed to be limited. Road densities on private lands in the LJCRP area exceed the NOAA Fisheries threshold. Both values would be rated as functioning at unacceptable risk using NOAA Fisheries Matrix thresholds.

Climate Change

Climate change has the potential to have impacts to aquatic habitat through increases in water temperature and changes in streamflows in response to changes in climates. The following information was developed by the Forest Service to highlight potential impacts to aquatic habitat in the Pacific Northwest:

> **Salmon and Trout in the Pacific Northwest and Climate Change**
>
> [Preparer: Pete Bisson, Aquatic and Land Interactions Program, Pacific Northwest Research Station. (http://www.fs.fed.us/ccrc/topics/salmon-trout.shtml, accessed 03/28/2011)]
>
> *Issue*
>
> One of the most important long-term threats to fish habitat resilience is climate change. A recent review of the effects of climate change on salmon (ISAB 2007) identified the following probable consequences of global warming along the Pacific coast of North America: (1) warmer temperatures will result in more precipitation falling as rain rather than snow, (2) snowpack will diminish and streamflow timing will be altered, (3) peak river flows will likely increase, and (4) water temperatures will continue to rise. Not all of these anticipated trends are necessarily harmful to aquatic habitat, and many pale in comparison to other anthropogenic factors, but they do have implications for salmon and trout populations.
>
> Climate change scenarios predict an increase in large flood events, wildfires, and forest pathogen outbreaks, all of which have some potential to improve fish habitat complexity as a result of flood plain reconnection and large wood recruitment. Many effects of climate warming, however, will have negative habitat consequences for salmon. A higher frequency of severe floods will result in increased egg and alevin mortality owing to gravel scour, especially for fall- and winter-spawning species. Retreating winter snowpacks will run off earlier in the spring (Mote et al. 2003), potentially altering the life cycles of salmon whose seaward migration is timed to coincide with nearshore plankton blooms (Pearcy 1997). Summer base flows will be lower, and the network of perennially flowing streams in a drainage system will shrink during the summer dry period, forcing fish into smaller wetted channels and less diverse habitats (Battin et al. 2006). Warmer water temperatures will increase physiological rearing costs and lower growth rates if warmer streams do not produce sufficient food resources to offset heightened metabolic demands. Additionally, summer temperatures may approach or exceed incipient lethal levels for salmon and trout (Crozier and Zabel 2006, Crozier et al. 2008), and higher temperatures will likely favor non-salmonid species that are better adapted to warmer water, including potential predators and competitors (Reeves et al. 1987).

As noted by Battin et al. (2006), climate change will force shifts in the distribution of salmon populations that will affect their ability to cope with natural disturbances, particularly drought. Streams located high in watersheds that historically provided some of the best habitat may no longer be accessible to salmon if snowpack is reduced, thus limiting available rearing areas and access to thermal refugia in summer. Crozier et al. (2008) modeled Chinook salmon (*Oncorhynchus tshawytscha*) population response to alternative climate scenarios in Idaho's Salmon River and found that even moderate changes significantly increased the risk of local population extirpation. Crozier and Zabel (2006) suggested that two climate-related factors (temperature and streamflow) could affect habitat in different ways depending on local site characteristics; narrow, confined streams were more sensitive to flow changes, and wide streams were more sensitive to temperature changes. They concluded that different aspects of climate change were important at different spatial scales, and that a diversity of conditions was needed for metapopulation stability.

Trout and salmon within the interior Columbia River Basin may be especially sensitive to climate change, according to a recent report by a scientific panel (ISAB 2007). Although the intensity of the effects will vary spatially, climate change will alter virtually all streams and rivers in the basin. Current predictions suggest that temperature increases alone will render 2 to 7 percent of headwater trout habitat in the Pacific Northwest unsuitable by 2030, 5 to 20 percent by 2060, and 8 to 33 percent by 2090. Salmon habitat may be more severely affected, in part because these fish are usually restricted to lower, hence warmer, elevations within the region. Salmon habitat loss would be most severe in Oregon and Idaho with potential losses exceeding 40 percent by 2090. Loss of salmon habitat in Washington would be less severe, with the worst-case scenario indicating about 22 percent loss by 2090.

Likely Changes

Temperature records show that the Pacific Northwest has warmed 1.8 ºF since 1900, approximately 50 percent more than the average global warming during the same period. The warming rate for the region in the 21st century is projected to range from 0.2 to 1.1 ˚F per decade. Until late in the 21st century, precipitation changes for the region are projected to be relatively modest and likely to be indistinguishable from natural variability; however, some models suggest an increase in winter storm severity. Most climate models project long-term increases in winter precipitation and decreases in summer precipitation. These changes in temperature and precipitation will alter the snowpack, streamflow, and water quality, particularly in the Columbia River Basin. Warmer temperatures will result in more precipitation falling as rain rather than snow. Snowpack will diminish, winter snow lines will retreat to higher elevations, and snowmelt timing will be altered. With earlier runoff, peak river flow will occur earlier in the year, and summer water temperatures will continue to rise as water levels drop.

Climate change has the potential to affect most freshwater life-history stages of trout and salmon. Increased frequency and severity of flood flows during winter will affect over-wintering juvenile fish and incubating eggs in the streambed. Eggs of fall- and winter-spawning fish, including Chinook, coho (*Oncorhynchus kisutch*), chum (*O. keta*) , sockeye salmon (*O. nerka*), and bull trout (*Salvelinus confluentus*), may suffer higher levels of mortality when exposed to increased flood flows. Warmer winter water temperatures will accelerate embryo development and may cause premature emergence

of fry. Bull trout require very cold headwater streams for spawning; therefore, a warming climate will disproportionately affect this species.

Options for Management

From a habitat resilience standpoint, maintaining as much water as possible in streams and lakes during periods of low flow will likely be the most effective way to combat the harmful effects of climate change, but other management actions could also produce long-term benefits. Crozier and Zabel (2006) used population viability analyses to predict that "increasing the freshwater carrying capacity for juveniles is most likely important for recovery. This may include improving the quality of existing habitats and making areas currently unoccupied accessible or suitable." Increased flooding associated with higher peak discharge in winter may result in greater societal pressure to prevent damage to homes and infrastructure by isolating rivers from their flood plains; therefore, habitat managers would be well served to ask where flooding can be allowed in a watershed and in particular where flooding will reconnect the river with flood-plain habitats of direct importance to overwintering salmon. Maintaining key flood-plain connections will also act as a hydrologic safety valve that helps reduce the scouring effect of high flows on redds.

Another management response to climate change involves restoring longitudinal connections throughout a drainage network, i.e., removing anthropogenic blockages to fish migrations up and down the watershed. With a constricted system of perennial stream channels in summer it will be important for all potentially usable habitats to be available.

A fourth management safeguard involves protecting and restoring riparian forests on valley floors and on alluvial terraces adjacent to stream channels. Riparian forests play an important role in the dynamics of the water table beneath and adjacent to streams, in moderating discharge during flow extremes, in controlling the concentration of soluble nutrients, in mediating the seasonal input of organic matter and terrestrial food items to aquatic ecosystems, and in regulating microclimate (Naiman et al. 2005).

Policies that explicitly maintain instream flows by limiting water withdrawals, enhancing flood-plain connectivity by opening historically flooded areas where possible, removing anthropogenic barriers to fish movement, and protecting riparian forests will be needed to conserve habitat resilience in the face of climate change. Without such policies in place, aquatic habitats are likely to become increasingly isolated, simplified, and less likely to recover after significant disturbance events.

Although options for forest managers to minimize the harm to aquatic resources from climate change are limited, there are several management actions that can help protect salmon and trout:

- Minimize anthropogenic increases in water temperature by maintaining well-shaded riparian areas.
- Maintain a forest stand structure that retains snow, reduces the "rain on snow" effect associated with forest openings, and promotes fog drip.
- Disconnect road drainage from the stream network to soften discharge peaks during heavy rainstorms.

- Ensure that fish have access to seasonal habitats, e.g., off-channel wintering areas or summer thermal refugia.
- Protect springs and large groundwater seeps from development and water removal, as these subterranean water sources will become increasingly important when surface flows are altered by climate change.
-

Impacts to Aquatic Habitat in the LJCRP Aquatic Analysis Area: Based on the above information, long-term changes to aquatic habitat in the analysis may occur as a result of global climate. These changes may include:

- Increases in water temperatures in response to increases in air temperature,
- Changes in runoff patterns in response to an increase in the amount of winter precipitation that falls as rain:
    - Decreases in summer streamflows in response to a reduction in snowpack.
    - Reduced duration of spring runoff but higher peak flows due to an increase the amount of winter precipitation that falls as rain

Activities proposed under Alternatives 2 and 3 are unlikely to have measureable cumulative effects with global climate change because:

1. The proposed thinning activities are unlikely to result in a change in runoff patterns because a significant decrease in forested cover will not occur.
2. Potential increases in water temperature as a result of proposed burning are unlikely to occur in the analysis area and if increases do occur they are unlikely to be measureable.

Foreseeable Future Activities

Wallowa-Whitman NF Travel Management Plan

The WWNF Travel Management Plan is being delayed until the Forest Plan Revision is complete. Therefore the Travel Management Plan will have no impact on the LJCRP.

Wallowa-Whitman NF Invasive Plants Treatment Plan

Alternative 2 was the selected alternative for the Invasive Plants Treatment Plan FEIS. Alternative 2 uses integrated manual, mechanical, herbicide, and cultural treatments on approximately 22,840 acres of mapped infestations, as well as on sites that may be detected in the future. Treatments will be completed following steps outlined in the Annual Implementation Planning process and Common Control Measures, according to Project Design Features and Herbicide Use Buffers that limit the extent and method of treatment appropriate to site conditions. In addition to these steps, the Early Detection, Rapid Response Decision Process will be followed for sites that may be detected in the future.

In 2005, the Pacific Northwest Regional Forester amended all Forest Plans in Region 6, adding new management direction, including an emphasis on early detection, and effective integrated treatment of invasive plants. The purpose of the Invasive Plants Treatment Plan EIS is to bring the treatment program on the Forest into compliance with the new standards, and allow for

effective treatments on all sites currently mapped and those that may be detected in the future. Initial treatments will rely more heavily on herbicides; but the goal of this project as invasive plant objectives are met, is to reduce the use of herbicides over time.

Effects on Aquatic Habitat Conditions

Invasive plants are a threat to aquatic and riparian habitats due to their negative effects to native ecosystems. Currently, invasive plant infestations are limited in extent in the LJCR project area (see Invasive Plants Specialist Report). Infestations are mainly located in RHCAs, travel corridors (i.e. roads). Treatment of invasive plants infestations along roads will be treated as part of the prevention strategy for the LJCR project. Impacts to aquatic and riparian habitats and aquatic species may result in short-term adverse impacts but will improve riparian conditions in the long-term.

Cumulative Effects Summary

Past and current management activities have had and are having impacts to aquatic habitat and aquatic species (including SR steelhead and redband trout) in the LJCRP aquatic analysis area. These impacts have resulted in a decline in aquatic and riparian habitats in the analysis area. Water temperatures and fine sediment levels in the project area are likely higher today then prior to European settlement. Current activities (including livestock grazing) on Forest Service lands are managed under the standards and guidelines of PACFISH which were developed to speed the recovery of riparian and aquatic habitats. The majority of streams in the project area are assumed to be recovering from past degraded conditions. However, fine sediment levels are elevated in the LJCP area. Grazing and roads are the two major management activities in the analysis area contributing to fine sediment effects.

Design Features to Protect Aquatic/Watershed Resources

The following design measures will be implemented to protect aquatic resources:

1. Delineate PACFISH RHCAs during layout:
    - Category 1 Streams – 300 feet slope distance from the edge of the active channel.
    - Category 2 Streams – 150 feet slope distance from the edge of the active channel.
    - Category 3 Ponds, Wetlands (>1 acre) - 150 feet slope distance from the edge of the wetland.
    - Category 4 Streams, Wetlands (<1 acre) - 100 feet slope distance from the edge of the active channel or the edge of the wetland.
2. Delineate 25 foot variable width no treatment buffers on Category 4 Streams within the Category 4 RHCA where treatment is prescribed. A Fish Biologist or Hydrologist will layout the 25 foot variable with no treatment buffers with Pre Sale.
3. Implement applicable PACFISH Standards and Guidelines
4. Implement the following project specific design features to minimize impacts to watershed and aquatic resources:

- Use low intensity prescribe fire to reduce fuels loads and reduce the risk of wildfire spread through RHCAs. Limit prescribed fire intensity and spread by using backing fire and not actively lighting in RHCAs.
- Where closed roads are reopened for mechanical thinning activities, re-close roads promptly following completion of the timber sale. Reseed with native grass seed mix as recommended by the zone botanist.
- To minimize increases in soil erosion as a result of timber sale activities: 1) rehabilitate landings after completion of timber harvest activities where needed to minimize bare soil, 2) use BMPs (e.g. scattering slash, seeding, construction of waterbars) to minimize erosion from skidtrails.
- All temporary roads constructed by the Lower Joseph Creek Restoration Project will be obliterates after completion of haul activities.

Blue Mt PDCs

Table 12. Activity restrictions for the LJCRP following the Blue Mountains Project Design Criteria

PACFISH/ INFISH Category	Fish Bearing and Designated Critical Habitat Streams	Permanently Flowing non- fish Bearing and Ponds, Lakes and wetlands > 1 acres	Seasonally Flowing or Intermittent Streams, wetlands < 1 acres, landslides and landslide-prone areas	RHCA Restrictions
Activity	**Default No Activity Buffers ***			
Thinning in RHCAs	100’	75’ on slopes < 30%	50’ on slopes < 30%	treatment by hand only (no ground based equipment) prior to treatment 500 – 2,500 stems per acre; post treatment fully stocked (generally 175 – 220 trees per acre) variable spacing all shade providing trees and long term wood recruitment trees retained only trees < 9” dbh

*RHCA restrictions are for the areas between the limited activity buffer and boundary of the full PACFISH buffer

Table 13. Fire/Fuels Activity restrictions for the LJCRP following the Blue Mountains Project Design Criteria

PACFISH / INFISH Category	Fish Bearing and Designated Critical Habitat Streams	Permanently Flowing non- fish Bearing and Ponds, Lakes and wetlands > 1 acres	Seasonally Flowing or Intermittent Streams, wetlands < 1 acres, landslides and landslide-prone areas	RHCA Restrictions
Activity	**Default Limited Activity Buffers***			
Prescribed Fire in RHCAs	100’	75’ on slopes < 30%	50’ on slopes < 30%	• treatment by hand only • all shade providing, instream and long term wood recruitment trees retained • fully stocked canopy retained • hand applied ignition (such as drip torch or fusees) within the limited activity buffer,
Slash Pile Burning	100’	75’	50’	• piles located outside the no activity RHCA buffer width and in locations to avoid damage to remaining overstory canopy • hand piling only (no mechanical treatments) • maximum size four feet in height and six feet in diameter • piles burned when there is a high soil moisture content
* RHCA restrictions are for the areas between the limited activity buffer and boundary of the full PACFISH buffer.				

Biological Evaluation for Regional Foresters Sensitive Species and Management Indicator Species report for Aquatic Species

This aquatic specialist report satisfies requirements of Forest Service Manual 2672.4 requiring the Forest Service to review all planned, funded, executed or permitted programs and activities for possible effects on proposed, endangered, threatened or sensitive species by completing a Biological Evaluation (BE). The BE process is intended to review the Lower Joseph Creek Restoration Project in sufficient detail to determine effects of alternatives on species in this evaluation and ensure proposed management actions would not:

- likely jeopardize the continued existence, or cause adverse modification of habitat, for a species that is proposed (P) or listed as endangered (E) or threatened (T) by the USDI Fish and Wildlife Service or NOAA National Marine Fisheries Service; or
- contribute to the loss of viability for species listed as sensitive (S) by USDA Forest Service, Region 6, or any native or desired, non-native species; nor cause any species to move toward federal listing (FSM 2672.4).

The following sources were used during the prefield review phase to determine the presence or absence of aquatic PETS species in the effects area for the Lower Joseph Creek Restoration Project:

1. Wallowa-Whitman N.F. GIS database
2. Regional Forester's (R6) sensitive animal list
3. ODFW stream survey and fish survey reports
4. Forest Service stream survey reports, Wallowa Valley RD, Enterprise, OR
5. Oregon Natural Heritage Program (ORNHP) database
6. Natural Heritage Conservation database (Biosource)
8. Oregon Native Fish Report (2005 Public Review Draft)
9. Species lists from USFWS and NMFS

Analysis Area

The analysis area for aquatic species is the same as used for aquatic habitat.

Proposed, Endangered, Threatened and Sensitive Aquatic Species

The following aquatic PETS species have been documented in the analysis area: Snake River (SR) steelhead (T). Western ridge mussels (S) have not been observed in the analysis area but may be present.

There will be no effect from proposed activities to bull trout (T), SR fall Chinook salmon (T), and SR spring Chinook salmon (T) as they are not present in the aquatic effects areas. Additionally, potential effects to aquatic habitat from the proposed activities will not extend into stream reaches occupied by SR fall Chinook salmon and SR spring Chinook salmon downstream of the analysis area. Habitats for other sensitive aquatic species for the WWNF are not present in the analysis area.

Critical habitat for SR steelhead is present in the analysis area.

Table 14. Fish species with special management status present or suspected to be in the aquatic effects area. Status: MIS = Forest Plan management indicator species, R6S = Region 6 sensitive species, T = Threatened.

Fish Species (Status)	Stream	Migration Habitat	Spawning Habitat	Summer Rearing Habitat
Redband Trout (MIS)	Davis Creek	Present	Present	Present
	Rush Creek	Present	Present	Present
	Lower Cottonwood Creek	Present	Present	Present
	Upper Cottonwood Creek	Present	Present	Present
	Swamp Creek	Present	Present	Present
	Joseph Creek	Present	Present	Present
	Sumac Creek	Present	Present	Present
	Broady Creek	Present	Present	Present
	Peavine Creek	Present	Present	Present
Snake River Steelhead (T, MIS)	Davis Creek	Present	Present	Present
	Rush Creek	Present	Present	Present
	Lower Cottonwood Creek	Present	Present	Present
	Upper Cottonwood Creek	Present	Present	Present
	Swamp Creek	Present	Present	Present
	Joseph Creek	Present	Present	Present
	Sumac Creek	Present	Present	Present
	Broady Creek	Present	Present	Present
	Peavine Creek	Present	Present	Present

Redband Trout (Management Indicator Species)

Redband trout, the resident form of *Oncorhynchus mykiss,* are a WWNF management indicator species. Redband trout in the Lower Joseph Creek project area likely share a common gene pool with steelhead. Redband trout are widely distributed in the affects area (Figure 2).

Life History

Redband trout are sensitive to changes in water quality and habitat. Adult redband trout are generally associated with pool habitats, although various life stages require a wide array of habitats for rearing, hiding, feeding, and resting. Pool habitat functions as important refugia during low water periods. An increase in sediment lowers spawning success and reduces the quantity and quality of pool and interstitial habitat. Other important habitat features include healthy riparian vegetation, undercut banks and LWD.

Spawning takes place from March through May. Redds tend to be located where velocity, depth and bottom configuration induce water flow through the stream substrate, generally in gravels at the tailout area of pools. Eggs incubate during the spring and emergence occurs from June through July depending on water temperatures. Redband trout may reside in their natal stream or may migrate to other streams within a watershed to rear. Habitat requirements are similar for redband trout and juvenile steelhead.

Abundance

Redband trout surveys have not been conducted in the LJCRP area. It is assumed that their abundance overlaps that of Snake River Steelhead and extend above this range particularly where barriers to anadromous fish exist.

Effects of the Alternatives

Alternative 1

Alternative 1 of the Lower Joseph Creek Restoration Project ***May Impact Individual redband trout and their Habitat***, but will not likely contribute toward federal listing or loss of viability to the population or species (MIIH).

Watershed and aquatic habitat conditions would likely remain in their current condition for the next 5 years. Current levels of fine sediment in the majority of streams in the analysis area are above the 20% threshold used to indicate adverse impacts to salmonids.

The majority of the timbered stands in the project area would be represented by a fuel model that is likely to exhibit moderate fire severities in the case of a wildfire. The likelihood of a fire start in the project area is high. Wildfires typically result in increases in fine sediment for three to five years, depending on the wildfire severity (Neary et al. 2005). Adverse impacts to aquatic habitat would likely occur where fine sediment levels exceed the 20% threshold. These levels would likely decrease spawning success for redband trout, and a decrease survival of juvenile salmonids may occur. Increases in stream temperatures can last longer depending on the severity of fire in riparian areas. If water temperatures exceed 64^{o}F for extended periods as a result of wildfire survival of redband trout would likely be reduced.

Alternative 2

Alternative 2 of the Lower Joseph Creek Restoration Project ***May Impact Individual redband trout and their Habitat*** (MIIH), but will not likely contribute toward federal listing or loss of viability to the population or species. Impacts to redband trout may occur as a result of short-term immeasurable increases in fine sediment. (see effects to aquatic habitat section).

Current levels of fine sediment in the majority of streams in the analysis area are below the 20% threshold used to indicate adverse impacts to salmonids. In these areas short-term potential increases in fine sediment from proposed prescribed burning and thinning activities are unlikely to result in measurable increases in fine sediment in streams in the analysis area.

Most streams in the analysis area currently exceed the 20% threshold. Commercial thinning activities are limited to about 1822 acres and. Prescribed burning activities would occur in a larger area but the effects relative to sediment will be mitigated by implementation of the project PDCs and BMPs. Short-term potential increases in fine sediment from proposed prescribed burning and thinning activities are unlikely to result in measurable increases in fine sediment in streams in the LJCRP area.

Impacts from activities proposed under Alternative 2 are unlikely to result in degradation of habitat for redband trout. Anticipated immeasurable increases in both fine sediment and water temperature are within habitat tolerances for redband trout

Cumulatively, aquatic habitat should improve over time in the analysis area. Fine sediment levels should decrease through time as a result of improved road closures and decommissioning activities . Alternative 2 may result in a short-term increase in fine sediment resulting from prescribed burning activities.

Alternative 3

Alternative 3 of the Lower Joseph Creek Restoration Project ***May Impact Individual redband trout and their Habitat*** (MIIH), but will not likely contribute toward federal listing or loss of viability to the population or species. Impacts to redband trout may occur as a result of short-term immeasurable increases in fine sediment and water temperature (see effects to aquatic habitat section).

Current levels of fine sediment in the majority of streams in the analysis area are above the 20% threshold used to indicate adverse impacts to salmonids. In these areas short-term potential increases in fine sediment from proposed prescribed burning and thinning activities are unlikely to result in measurable increases in fine sediment in streams in the analysis area.

Impacts from activities proposed under Alternative 3 are unlikely to result in degradation of habitat for redband trout. Anticipated immeasurable increases in both fine sediment and water temperature are within habitat tolerances for redband trout.

Cumulatively, aquatic habitat should improve over time in the analysis area. Fine sediment levels should decrease through time as a result of improved road closures and decommissioning activities . Alternative 3 will likely not result in a short-term slowing of recovery of aquatic habitat in the analysis area.

In the long-term, the proposed action will improve vegetative conditions and maintain the natural fire regime in the project area which will have beneficial impacts to redband trout and their habitat

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Western Ridge Mussel (Region 6 Sensitive Species)

Western ridge mussels were designated a Region Forester's Sensitive Species during the development of the 2008 R6 Sensitive Species List. Initially, western ridge mussels were suspected to be present on the Wallowa-Whitman NF based a review of occurrence records. Additional record reviews and data searches by WWNF personnel revealed that western ridge mussels were historically present in large numbers in the Snake River and confirmed that western ridge mussels are currently present in the Snake River, Hells Canyon portion, on the Hells Canyon NRA. The current Snake River western ridge mussel population is suspected to be at very low levels compared to pre-European settlement. Relic shells of western ridge mussels were collected by WMO personnel during a monitoring trip on the Hells Canyon portion of the Snake River in October of 2010. Western ridge mussels were also documented in the Powder River (1963) and Grande Ronde River (pre-1929) downstream of the WWNF.

Life History

Western ridge mussels occur in streams of all sizes and are rarely found in lakes or reservoirs. They are found mainly in low to mid-elevation watersheds, and do not often inhabit high elevation headwater streams where western pearlshells are found. They often share habitat with *Margaritifera falcata* (western pearlshell mussel) throughout much of the Pacific Northwest. They inhabit mud, sand, gravel, and cobble substrates. Western ridge mussels are more tolerant of fine sediments than western pearlshells and occupy depositional habitats and banks. They can withstand moderate amounts of sedimentation, but are usually absent from habitats with highly unstable or very soft substrates. Cursory evidence suggests that western ridged mussels are more pollution-tolerant than other native mussels.

Habitat for western ridge mussels appears to have fairly broad environmental gradients. In the John Day system western ridge mussels are more abundant in the mid and lower reaches of the M.F. and N.F. John Day Rivers compared to western pearlshell mussels (*Margaritifera falcata*) (Brim Box et al. 2006). Habitat in the middle reaches of these streams in warmer and has higher levels of fine sediment compared to the upper reaches. In the Salmon River, Vannote and Minshall (1982) found western pearlshell mussels being replaced by western ridge mussels where fine sediment had increased as a result of timber management activities in the watershed.

Threats to western ridge mussels and other species of freshwater mussels include loss of host fish, introduction of non-native fish, dams, channel modification from channelization and suction dredge mining, thermal pollution, chemical pollution, sedimentation and siltation from silvicultural and agricultural practices, water withdrawal and diversion, and livestock grazing in riparian areas. Since western ridge mussels require stable habitats, they may be particularly threatened by dewatering and other activities that cause shifting substrates, water level fluctuations, and seasonal hypoxia or anoxia. Species that live for 20-30 years, as has been suggested for western ridge mussels, often appear to have healthy populations, when in reality only the older adults may be withstanding environmental changes and the population may no longer be reproducing.

Abundance

Western ridge mussels have not been documented in the analysis area. Suitable habitat maybe present in Joseph Creek, Davis Creek, Swamp Creek, Elk Creek and Broady Creek but only cursory searches have occurred.

Effects of the Alternatives

Alternative 1

Alternative 1 of the Lower Joseph Creek Restoration Project will have ***No Impact on Individual western ridge mussels and their Habitat*** (NI), Watershed and aquatic habitat conditions would likely remain in their current condition for the next 5 years. Current aquatic habitat conditions in the analysis area are not likely limiting for western ridge mussels.

Western ridge mussels would be vulnerable to impacts from large-scale wildfires that result in large increases in fine sediment and changes in peak flows. Western ridge mussels are adapted to habitats with fine sediment; however, large influxes of fine sediment could result in the burying of mussel beds and the death of individuals. Western ridge mussels require stable streambeds for mussel beds to develop. Increases in peak flows that scour streambed substrates destroy existing mussel beds. The majority of the timbered stands in the project area would be represented by a fuel model that is likely to exhibit moderate fire severities in the case of a wildfire. The likelihood of a fire start in the project area is high however due to the fragmented nature of the landscape it is unlikely that a large scale fire would develop.

Alternative 2

Alternative 2 of the Lower Joseph Creek Restoration Project ***May Impact Individual western ridge mussels and their Habitat*** (MIIH), but will not likely contribute toward federal listing or loss of viability to the population or species. Impacts to western ridge mussels may occur as a result of short-term immeasurable increases in fine sediment (see effects to aquatic habitat section).

Current levels of fine sediment in the majority of streams in the analysis area are below the 20% threshold used to indicate adverse impacts to salmonids and possibly the western ridge mussel. In these areas short-term potential increases in fine sediment from proposed prescribed burning and thinning activities are unlikely to result in measurable increases in fine sediment in streams in the analysis area.

Most streams in the analysis area currently exceed the 20% threshold. Commercial thinning activities are limited to about 1822 acres and. Prescribed burning activities would occur in a larger area but the effects relative to sediment will be mitigated by implementation of the project PDCs and BMPs. Short-term potential increases in fine sediment from proposed prescribed burning and thinning activities are unlikely to result in measurable increases in fine sediment in streams in the LJCRP area.

Impacts from activities proposed under Alternative 2 are unlikely to result in degradation of habitat for western ridge mussels. Anticipated immeasurable increases in both fine sediment and water temperature are within habitat tolerances for western ridge mussels.

Cumulatively, aquatic habitat should improve over time in the analysis area. Fine sediment levels should decrease through time as a result of improved road closures and decommissioning

activities . Alternative 2 may result in a short-term increase in fine sediment resulting from prescribed burning activities.

In the long-term, the proposed action will improve vegetative conditions and maintain the natural fire regime in the project area which will have beneficial impacts to western ridge mussels and their habitat.

Alternative 3

Alternative 3 of the Lower Joseph Creek Restoration Project ***May Impact Individual western ridge mussels and their Habitat*** (MIIH), but will not likely contribute toward federal listing or loss of viability to the population or species. Impacts to western ridge mussels may occur as a result of short-term immeasurable increases in fine sediment and water temperature (see effects to aquatic habitat section).

Current levels of fine sediment in the majority of streams in the analysis area are below the 20% threshold used to indicate adverse impacts to salmonids and likely the western ridge mussel. In these areas short-term potential increases in fine sediment from proposed prescribed burning and thinning activities are unlikely to result in measurable increases in fine sediment in streams in the analysis area.

Impacts from activities proposed under Alternative 3 are unlikely to result in degradation of habitat for western ridge mussels. Anticipated immeasurable increases in both fine sediment and water temperature are within habitat tolerances for western ridge mussels.

Cumulatively, aquatic habitat should improve over time in the analysis area. Fine sediment levels should decrease through time as a result of improved road closures and decommissioning activities . Alternative 3 will likely not result in a short-term slowing of recovery of aquatic habitat in the analysis area.

In the long-term, the proposed action will improve vegetative conditions and maintain the natural fire regime in the project area which will have beneficial impacts to western ridge mussels and their habitat.

Steelhead (ESA Threatened, Management Indicator Species)

Snake River steelhead were listed by the National Marine Fisheries Service (NMFS) as threatened under the ESA on March 25, 1999 (64 FR 15417). Snake River steelhead are also a WWNF management indicator species. Snake River steelhead are broadly distributed in the analysis area (Figure 2). Critical habitat for SR steelhead was designated on September 2, 2005 (70 FR 52630). Critical habitat is present and overlaps steelhead distribution in the analysis area.

Life History

Steelhead trout are the anadromous form of *O. mykiss*. Adult summer steelhead return from the ocean to freshwater from June through September. Adults overwinter in large rivers while sexually maturing. Adults resume migration to spawning streams in early spring the following year. Spawning takes place from March through May. Eggs incubate during the spring and emergence occurs from April through July depending on water temperatures. Juveniles typically spend two to three years in freshwater. Juvenile steelhead generally utilize habitats with higher water velocities than juvenile Chinook salmon. In winter, juveniles utilize deep pools with abundant cover. Juveniles may reside in their natal stream for their entire freshwater rearing

phase or may migrate to other streams within a watershed. Smoltification occurs during late winter and emigration to the ocean occurs during spring. Summer steelhead normally rear for 1 to 2 years in the ocean.

Abundance

Steelhead are widely distributed in the Lower Grande Ronde Subbasin including throughout the Lower Joseph Creek analysis area (Figure 2). The current level of the Lower Grande Ronde steelhead population level is unknown but is believed to be similar to the current level of the Joseph Creek population (NPPC 2004, ODFW 2005). The Joseph Creek steelhead population is estimated to be about 20% of historic levels (NPPC 2004). .

Aquatic Management Indicator Species

The Wallowa-Whitman National Forest Land and Resource Management Plan identified two fish species as Management Indicator Species (MIS). These include the redband/rainbow trout and steelhead (USDA 1990). These species were selected as they were considered to be good indicators of the maintenance and quality of instream habitats. The habitats were identified as high quality water and fishery habitat.

The NFMA regulations require that "fish and wildlife habitat be managed to maintain viable populations of existing ……..species in the planning area". To ensure that these viable populations are maintained , the Pacific Northwest Region of the Forest Service has identified management requirements for a number of species within the region. These Management Indicator Species are emphasized either because of their status under ESA or because their populations can be used as an indicator of the health of a specific type of habitat (USDA 1990).

MIS Selection

The following aquatic MIS species have been documented in the analysis area: redband trout, and Snake River Basin steelhead. These species are indicators of riparian and aquatic habitat health. Monitoring for these MIS species consists of field inventory of stream conditions (WWNF Forest Plan Chap 5, p 11). Current inventory methods for stream and riparian conditions include Forest Service Level II stream survey reports on fish bearing streams and the state of Oregon StreamNet fish distribution data base, as well as ODFW spawning ground surveys for steelhead redds. Steelhead viability data from the ICTRT and found in the Oregon Snake River Recovery Plan are used to characterize population trends for Snake River Steelhead. Only presence absence surveys have been completed for redband trout/rainbow trout in the project area.

Steelhead – The viability criteria defined by the Interior Columbia Technical Review Team reflects the hierarchical structure of salmonid populations and species. The criteria describe the biological characteristics for the species, Major Population Groups (MPGs) and independent populations that are consistent with a high probability of long-term persistence. The ICTRT used the viability criteria to assess the extinction risk based on four different viable salmonid population (VSP) parameters: abundance, productivity, spatial structure and diversity. The

ICTRT also assessed the "gap" between the populations current status and the desired status for delisting based on the viability criteria. The ICTRT used the information from the population – level assessments to evaluate viability at the next hierarchical level, the MPG. All Steelhead MPGs need to meet the ICTRTs viability critiera for the ESU to be rated viable.
The ICBTRT identified 25 historical populations in five MPGs (ICBTRT 2007; Ford 2011). The Grande Ronde River MPG includes four independent populations: Upper Grande Ronde, Lower Grande Ronde, Joseph Creek, and Wallowa River. According to the ICBTRT (2007), these northeast Oregon populations formed a group as a result of shared habitat conditions, genetic characteristics that indicate similarity between the populations and divergence from populations in other MPGs, and geographic separation from populations in tributaries which enter the Snake River downstream and upstream from the Grande Ronde River (NMFS 2012).

ICBTRT (2007) determined that the Joseph Creek steelhead population currently meets the viability criteria. The population's overall viability rating is Highly Viable, with an abundance/productivity rating of very low risk and a spatial structure/diversity rating of low risk. The 10-year geometric mean abundance of natural-origin spawners is 2,186 with is 4.4 times the minimum abundance threshold of 500 spawners. The 10 year geometric mean productivity (1.94 R/S) is above the 1.49 R/S required at the minimum abundance threshold for a risk of extinction less than 1 percent over 100 years.

The Wallowa-Whitman National Forest is utilizing this viability assessment for Snake River Steelhead populations for the purposes of MIS assessment.

Redband/Rainbow Trout–
Redband trout habitat requirements are similar to that of juvenile steelhead. Redband trout are sensitive to changes in water quality and habitat. Adult redband trout are generally associated with pool habitat, although other life stages require a wide array of habitats for rearing, hiding, feeding and resting. Pool habitat is an important refugia during low water periods. An increase in sediment in the stream channel lowers spawning success and reduces the quality and quantity of pool habitat. Other important habitat features include healthy riparian vegetation, undercut banks and large wood debris. The Wallowa-Whitman National Forest is utilizing this fish/habitat relationship to provide the basis for assessment of redband trout populations for the purposes of MIS assessment.

Only presence/absence surveys have been completed for resident salmonid species (redband trout) in the LJCRP area. In the absence of redband trout population trend data, the Wallowa-Whitman National Forest has measured key habitat variables, and then assessed changes expected to occur as a result of project activities. This MIS analysis assumes that activities that maintain and improve aquatic/riparian habitat will provide for resident fish population viability on Wallowa-Whitman National Forest lands.

Habitat Condition – The Wallowa-Whitman National Forest has completed Forest Service Region 6 Stream Surveys in fish-bearing streams in the LJCRP area (Table 4). The stream survey protocol (based on the Hankin and Reeves survey methodology) guides collection of field data for stream channels, riparian vegetation, and fish presence. Data collected from these surveys are then rated using habitat indicator benchmarks developed by NMFS and FWS (NMFS 1996;

USDI 1998). The habitat data reflects indicators that range from Properly Functioning to Functioning at Risk to Not Properly Functioning for streams in the LJCRP area (see Aquatic Effects Analysis)

The amount of occupied MIS habitat on the Wallowa Whitman National Forest ranges from about 320 miles to over 990 miles, depending on the species (Table 15.). Based on GIS analysis, the amount of MIS habitat in the project area (14.6 – 133.5 miles) represents a small percentage of the overall miles of habitat for the entire forest.

Table 15. MIS distribution in the project area in relation to the Wallowa-Whitman National Forest range.

MIS	**Forest Distribution (mi)***	**MIS in Analysis Area (mi)**	**Proportion of MIS habitat in Project Area out of total on Forest**
Rainbow Trout/ Redband Trout	320	14.6	4.6
Steelhead	990	133.5	13.5

*Miles calculated for the Wallowa-Whitman National Forest.

All of the LJCRP activities proposed would occur upstream from MIS fish. Therefore, there is no potential for direct effects to any MIS. There is potential for indirect affects to MIS downstream from the proposed activities because of their proximity to the project area. Aquatic habitat indicators potentially affected include fine sediment levels and LWD quantities. Road management could cause changes to local hydrology such as increased runoff rates, accelerated erosion and sedimentation. Tree removal could potentially reduce large wood availability in headwater streams and not directly associated with MIS fish bearing streams. MIS life stages present in the area of exposure from the project include juvenile, adult, and eggs.

Implementation of Standards and Guidelines in the Forest Plan as amended by PACFISH (USDA/USDI 1995) and LJCRP PDCs and BMPs will avoid negative indirect effects to MIS. Road maintenance, road closure and some road decommissioning will result in an overall net reduction of road-related sediment delivery during the project and in the long-term. The result would be a beneficial effect to the sediment regime, caused by a reduction of anthropogenic-derived sediment delivered to the stream network as compared to current watershed conditions. Additionally, thinning densely stocked stands in the outer edge of RHCAs restore natural species composition and promote large tree growth. The largest trees are retained at expected stand densities. On perennial and fish bearing streams, there is a no harvest buffer 300 to 600 feet wide which when considered along with site potential tree height in the project area, will maintain all existing LWD that could potentially fall into streams.

Effects of the proposed action on MIS species or their habitat across the project area, when considered cumulatively with other activities in the project area, would be beneficial to some of the important habitat indicators. A net decrease to fine sediment levels is expected, which would improve habitat conditions for MIS and their habitat. Reduced sediment delivery improves important aquatic elements such as cleaner water, higher quality substrates for spawning and

rearing habitat, and less pool infilling. Thinning densely stocked RHCAs improves vegetation conditions, which leads to increased large wood recruitment and creates more fire resilient stands along streams. The cumulative effects are within the scope of anticipated effects to aquatic resources determined in the Wallowa-Whitman National Forest Land and Resource Management Plan (USDA 1990).

Improved Conditions

The LJCRP will improve habitat conditions for the aquatic MIS in the project area. Anthropogenic fine sediment delivery in the project area will be decreased as soon as project activities begin; reduced delivery will be maintained after the project is completed. In the long-term, there would be a reduction in artificially induced sediment entering the stream system, benefiting aquatic MIS and their habitat. Therefore, the project will not contribute to a negative trend in viability on the Wallowa-Whitman National Forest for these species.

Consistency with Direction, Regulations and Laws

Wallowa-Whitman Forest Plan

The Lower Joseph Creek Restoration Project is consistent with the WWNF Forest Plan including the 1995 PACFISH amendment. In addition to meeting standards and guidelines for water quality (see effects to aquatic habitat discussion), the proposed activities are consistent with all Forest Plan Watershed, and PACFISH standards and guidelines including:

- Watershed Standard and Guideline 6: Thinning activities are not proposed within 100 ft of Class I and II streams.
- Watershed Standard and Guideline 8: Thinning activities will not occur in Category 1,2,3 RHCAs, therefore there will be no reduction in LWD.
- PACFISH RF-2a: There is no new road construction proposed under Alternative 2 and 3 and no new construction will occur in RHCAs.
- PACFISH RF-2b: Proposed skid trails and landings are located outside of RHCAs.
- PACFISH RF-3a & b: Roads that will be used for proposed vegetation management activities will have drainage problems repaired and will be brought up to standards prior to haul.
- PACFISH FM-1: Proposed activities (noncommercial and commercial thinning, prescribed burning) would not retard the attainment of Forest Plan RMOs for aquatic habitat (pool frequency, water temperature, LWD, bank stability, lower bank angle, and width-to-depth ratio). Proposed burning activities may result in short-term increases in fine sediment and decreases in shading in RHCAs adjacent to streams in the aquatic effects areas. However, the magnitudes in the increases in fine sediment or reduction of shading are unlikely to result in measurable changes in fine sediment levels or water temperatures in the aquatics effects area.

Endangered Species Act

The LJCRP will be the subject of consultation under Sec 7 of the Endangered Species Act. A Biological Assessment will be prepared and submitted to NOAA Fisheries. The consultation process will follow the Streamlined Consultation Procedures (1999) as revised by the Wallowa-Whitman in 2003.

The Biological Assessment will address the LJCRP effects on the federally listed Snake River Steelhead and its designated critical habitat.

The Lower Joseph Creek Restoration Project is being prepared to be consistent with the Blue Mountain Project Design Criteria (PDC) process. The PDC process was developed by the Blue Mountain national forests (Malheur, Umatilla, and Wallowa-Whitman national forests), USFWS (La Grande Field Office) and NMFS (La Grande Field Office) to expedite the consultation of management projects which meet agreed to criteria that result in project effects that are insignificant. The USFWS Letter of Concurrence for the PDC process states "...This Instrument establishes Project Design Criteria (Criteria) that define very conservative effects thresholds for designing and evaluating projects. The Bureau and the Forests have determined, and the Service concurs, that use of the Instrument and subsequent implementation of projects that are consistent

with the Criteria may affect but are not likely to adversely affect species listed as threatened or endangered..." (USFWS LOC September 26, 2002). The NMFS Letter of Concurrence states "To qualify for the PIC [Programmatic Informal Consultation] expedited consultation process, projects would be designed to be consistent with the PDC, ensuring that no take of listed species or adverse effects to their habitat would occur as a result of the planned project. In addition, the PDC are designed to ensure that any adverse interrelated or interdependent effects of the designed projects are avoided..." (LOC Page 3, December 5, 2002).

Most aspects of the LJCRP will be consistent with the Blue Mountain PDCs. The treatment of Category 4 RHCAs will necessitate the preparation of a Biological Assessment that will describe the effects of treatment of the Category 4 RHCAs. This aspect of the LJCRP is not consistent with the PDCs and so the use solely of the PDCs for the LJCRP is not appropriate for Sec 7 consultation.

Magnuson-Stevens Act

The Magnuson-Stevens Fishery Conservation and Management Act (MSA), as amended by the Sustainable Fisheries Act of 1996 (Public Law 104-267), requires the inclusion of essential fish habitat (EFH) descriptions in Federal fishery management plans. In addition, the MSA requires Federal agencies to consult with NMFS on activities that may adversely affect EFH. The Lower Grande Ronde subbasin (HUC 17060106) has been designated as EFH for Chinook and coho salmon.

Based on the similarities between habitat for steelhead and salmon species and the effects analysis for the Lower Joseph Creek Restoration Project on Snake River steelhead habitat, proposed activities may affect but are not likely to adversely affect EFH for MSA-managed species in the aquatic effects analysis area. Short-term potential increases in fine sediment from proposed prescribed burning and thinning activities are unlikely to result in measurable increases in fine sediment in streams in the analysis area. Based on the analysis of effects to aquatic habitat, mortality of overstory trees as a result of burning in the RHCA adjacent to streams in the analysis area is unlikely to result a reduction in shading and a measurable increase in water temperature in streams in the analysis area. In the long-term, the proposed action will improve vegetative conditions and maintain the natural fire regime in the project area which will have beneficial impacts to EFH. Since adverse impacts from proposed activities will not extend downstream of the aquatic effects area, no effect to EFH downstream of the aquatic effects analysis area will likely occur.

Floodplains and Wetlands

The proposed action alternatives would have no impact on floodplains or wetlands as described in Executive Orders 11988 and 11990. Floodplains and wetlands will be protected by applicable RHCAs.

Recreational Fisheries

The Lower Joseph Creek Restoration Project will not result in reductions in quantity, function, sustainable productivity, and distribution of recreational fisheries as directed under Executive Order 12962, Recreational Fisheries.

Irreversible/Irretrievable Effects

Irreversible effects are not expected. Reduced population viability for Snake River steelhead and redband trout is not expected. PACFISH established explicit goals and objectives for anadromous fish habitat condition and function. By following PACFISH standards and guidelines as well as design criteria specific to this project, it is believed that irretrievable commitment of this resource can be avoided. The goal of PACFISH is to achieve a high level of habitat diversity and complexity through a combination of habitat features.

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Appendix A – Summary of Effects Determinations for Aquatic Species

Occurrence of aquatic species with special management status in the Lower Joseph Creek Restoration project area and effects determinations.

Common Name	Scientific Name	Status	Occurrence		Effects Determination	
			WWNF	Lower Joseph Analysis Area	Alt 2	Alt 3
SR Steelhead	*Oncorhynchus mykiss*	ESA Threatened	Present	Present	NLAA	NLAA
Critical Habitat - SR Steelhead		Designated	Present	Present	NLAA	NLAA
SR Spring Chinook Salmon	*Oncorhynchus tshawytscha*	ESA Threatened	Present	Not Present	NE	NE
Critical Habitat - SR Spring Chinook Salmon		Designated	Present	Not Present	NE	NE
SR Fall Chinook Salmon	*Oncorhynchus tshawytscha*	ESA Threatened	Present	Not Present	NE	NE
Critical Habitat - SR Fall Chinook Salmon		Designated	Present	Not Present	NE	NE
CR Bull Trout	*Salvelinus confluentus*	ESA Threatened	Present	Not Present	NE	NE
Critical Habitat - CR Bull Trout		Designated	Not Present	Not Present	NE	NE
Inland Redband Trout	*Oncorhynchus mykiss*	MIS	Present	Present	MIIH	MIIH
Westslope Cutthroat Trout	*Oncorhynchus clarkii lewisi*	R-6 Sensitive	Present	Not Present	NI	NI
Western Ridge Mussel	*Gonidea angulata*	R-6 Sensitive	Present	Habitat Present	MIIH	MIIH
Shortface Lanx (Giant Columbia River limpet)	*Fisherola nuttalli*	R-6 Sensitive	Present	Habitat Not Present	NI	NI
Columbia Pebblesnail	*Fluminicola fuscus (=columbianus)*	R-6 Sensitive	Present	Habitat Not Present	NI	NI
Pristine Springsnail	*Pristinicola hemphilli*	R-6 Sensitive	Present	Habitat Not Present	NI	NI

Effects Determinations: NI = No Impact, MIIH = May Impact Individuals or Habitat, NE = No Effect, NLAA = Not Likely to Adversely Affect, LAA = Likely to adversely Affect

Habitat Descriptions for Aquatic R6 Sensitive Species for the Wallowa-Whitman National Forest.

Common Name	Scientific Name	Status[1] on WWNF	Habitat
Shortface Lanx (Giant Columbia River limpet)	*Fisherola nuttalli*	D	Found in unpolluted rivers and large streams, in highly oxygenated, swift-flowing, cold water on stable boulder or bedrock substrates, often in the vicinity of rapids. Macrophytes and epiphytic algae generally rare to absent at sites for the species. Not found in locations with sediment or silt deposition. Documented in Snake River
Columbia Pebblesnail (Ashy Pebblesnail)	*Fluminicola fuscus*	D	Found in larger tributaries and rivers, on upper surfaces of stable rocks, boulders and bedrock outcrops in fast current, in relatively shallow water. Species requires cold water with high oxygen content, so is not found behind impoundments, or where water is warm, slow, nutrient-enriched or turbid. Generally found in areas with few aquatic macrophytes of epiphytic algae. Documented in Snake River
Pristine Springsnail	*Pristinicola hemphilli*	D	Majority of known sites are in very small, undisturbed cold springs or seeps with slow to moderate flow; sometimes in larger springs and spring runs or spring-influenced portions of small streams. Substrate usually coarse gravel/cobble. *Rorippa*, *Mimulus* and bryophytes are common plant associates. Many sites are in semiarid sage scrub habitats, at low-medium elevation. Sites in Cascades and Southern Oregon in fairly dense Douglas fir forests at low-medium elevation.
Western Ridged Mussel	*Gonidea angulata*	D	Western ridged mussels occur in streams of all sizes and are rarely found in lakes or reservoirs. They are found mainly in low to mid-elevation watersheds, and do not often inhabit high elevation headwater streams where western pearlshells are found. They often share habitat with the western pearlshell throughout much of the Pacific Northwest. They inhabit mud, sand, gravel, and cobble substrates. They are more tolerant of fine sediments than western pearlshells and occupy depositional habitats and banks. They can withstand moderate amounts of sedimentation, but are usually absent from habitats with highly unstable or very soft substrates. Cursory evidence suggests that western ridged mussels are more pollution-tolerant than other native mussels.

1) D=Documented, S=Suspected